
Article

Comparison of Urine and Oral Fluid for Workplace Drug Testing

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Abstract

Aims: To determine the relative detection rates of urine versus oral fluid testing in a safety sensitive industry and the correlation with diagnosed substance use disorders and possible impairment at work.

Methods: The trial involved 1,500 paired urine and oral fluid tests performed in accordance with Australian Standard/New Zealand Standard (AS/NZS) 4308:2008 and AS 4760:2006. Workers who returned a positive test were screened for substance use disorders, as defined by DSM-5, and for possible impairment at work following that particular episode of substance use.

Results: Substances were detected in 3.7% ($n = 56$) of urine samples and 0.5% ($n = 8$) of oral fluid samples ($p < 0.0001$). One worker (0.07%) had a substance detected on oral fluid alone versus 49 workers (3.3%) who had substances detected on urine alone. Twelve workers returned a positive result, defined as being consistent with the use of an illicit drug or a controlled substance without a clinical indication and prescription. Nine workers tested positive on urine alone, one on oral fluid alone and two on both ($p = 0.0114$). Of note, 6/11 workers who tested positive on urine had possible impairment at work and 2/11 had a substance use disorder versus 2/3 and 0/3, respectively, who tested positive on oral fluid.

Conclusions: Urine drug testing performed in accordance with AS/NZS 4308:2008 is more likely to detect overall substance use and illicit drug use than oral fluid testing conducted in accordance with AS 4760:2006. Urine testing performed in accordance with AS/NZS 4308:2008 may also be more likely to detect workers with possible impairment at work and substance use disorders than oral fluid testing performed in accordance with AS 4760:2006.

Introduction

Sydney Trains and New South Wales (NSW) Trains have drug and alcohol policies, and conduct workplace drug testing, in accordance with legislative requirements. Each year, on a random basis, a minimum 25% of all rail safety workers must be selected to undertake drug or alcohol testing (1). In the case of random testing, the 25% figure must be met by urine drug testing. Drug testing above the minimum 25% requirement can be conducted using other matrices such as oral fluid.

To date urine has been used as the sole matrix for all drug testing, however, at the request of trade unions during enterprise

bargaining negotiations in 2014, a requirement to trial oral fluid testing was written into the Sydney Trains Enterprise Agreement 2014 and the NSW Trains Enterprise Agreement 2014 and ratified by the Fair Work Commission. The clauses state that both parties agree to establish and monitor a trial of oral fluid testing as part of the employer's testing regime, and that the procedure for the trial shall be developed via a consultative process using a working party comprising employer, union and employee representation.

Urine drug testing is a well-established method of detecting drug use but other matrices are available. Due to its convenience, oral fluid testing is used for the roadside drug testing of drivers, and the

publication of Australian Standard (AS) 4760:2006 (2) facilitated the use of oral fluid not only for roadside driver testing, but also in other situations including the workplace. AS 4760:2006 states that although there is a relationship between blood and oral fluid concentrations which may allow an inference of relatively recent use of drugs to be made (within hours), it is not appropriate to relate the presence of drugs in oral fluid to impairment. The detection of a substance in urine or oral fluid does not indicate that the person was necessarily impaired at that time.

The detection time for substances is generally longest in hair followed by urine, sweat, oral fluid and then blood (3). Illicit drugs and their metabolites can be detected in urine for up to 4 days after a single dose and for weeks, or even months in exceptional cases, following chronic use of cannabis (3). In oral fluid, drugs of abuse are typically detected for 12 to 48 h, although methylamphetamine has been detected for 72 h following four doses and cocaine has been detected for up to 9 days in chronic users (3).

Testing for drugs in the workplace, and the role of oral fluid versus urine as a testing matrix, has been the subject of legal scrutiny over the years. These legal decisions have influenced the choice of matrix used for drug testing in some workplaces and contributed to the trade unions requesting this trial. Some legal decisions have favored the use of oral fluid over urine for workplace drug testing, for example, *Shell Refining (Australia) Pty Ltd v Construction, Forestry, Mining and Energy Union (CFMEU)* (4) and *Endeavour Energy v Communications, Electrical, Electronic, Energy, Information, Postal, Plumbing and Allied Services Union of Australia and others* (5). In both of these decisions, Senior Deputy President Hamberger concluded:

both parties also recognise that random testing is an intrusion on the privacy of the individual which can only be justified on health and safety grounds. The employer has a legitimate right (and indeed obligation) to try and eliminate the risk that employees might come to work impaired by drugs or alcohol such that they could pose a risk to health or safety. Beyond that the employer has no right to dictate what drugs or alcohol its employees take in their own time. Indeed, it would be unjust and unreasonable to do so.

In the *Endeavour Energy* decision, Senior Deputy President Hamberger also concluded that “Neither method tests directly for impairment. However, a method which tests for recent consumption (only) is more likely to identify someone who is impaired. While some witnesses regard this as a weakness, it is precisely because it only detects for recent use that oral fluid testing is a better indicator of likely impairment as a result of smoking cannabis (the most widely used drug apart from alcohol) than a urine test.” The Senior Deputy President also noted that: “urine testing may be unable to identify that someone has smoked cannabis in the previous four hours—precisely the time frame which is most relevant for identifying likely impairment.”

On appeal to the Full Bench, it was noted that “the goal of the workplace drug testing regime [is] to eliminate the risk of employees at work being impaired by drugs so as to pose a risk to workplace health or safety”. Submissions were made that “... persons affected by ‘hangover’ effects, chronic usage problems and drugs pose a risk to health and safety” (5). The appeal was dismissed in 2012 but, as mentioned previously, the earlier decision in this case and in *Shell Refining (Australia) Pty Ltd v CFMEU* led to some Australian employers moving to oral fluid testing and was a factor in this trial proceeding.

There have also been other cases in the area of workplace drug testing that have favored the use of urine tests (6–8). In the case of

the *CFMEU v Port Kembla Coal Terminal Limited*, Commissioner Cambridge of the Fair Work Commission noted that:

... the expert evidence confirmed that oral fluid sampling was an inferior means to detect longterm use of other drugs such as opioids, cocaine and amphetamine related psycho stimulants. The wider window of detection was one of the primary aspects of the opposition to urine testing. However, it is the wider window of detection which enables identification of long-term drug use, (via levels fixed by AS/ NZS 4308:2008). Any suggestion that this is detection without relevant safety implications is further dispelled by evidence about the “hangover” effects of drugs like methylamphetamine. As just one example, the evidence of the physiological and psychological impacts of withdrawal from methylamphetamine provides compelling basis to detect long-term drug use.

On appeal to the full bench the decision to permit Port Kembla Coal Terminal Limited to conduct both urine and oral fluid testing was upheld but it was noted in conclusion that “... because its window of detection more closely approximates the likely period of impairment compared with urine a ‘positive’ oral fluid test result is more likely to be associated with impairment than a ‘positive’ urine test result” (9).

In another decision, the Full Bench of the Fair Work Commission refused a Sydney Airport worker leave to appeal against a finding that he had not been unfairly dismissed. In this decision, it was considered that:

... there is currently no direct scientific test for impairment arising from the use of cannabis. Saliva testing can more accurately detect recent cannabis use than urine testing, which means that it may be a better proxy indicator of the possibility of impairment, but it remains the case that it cannot conclusively demonstrate impairment or non-impairment. Therefore, where an employee who shows no obvious signs of impairment undergoes a drug test at work and tests positive for cannabis use, the employer is placed in a difficult position ... Apart from reliance upon the employee’s own explanation about the matter, which will probably not be verifiable, the employer will therefore not be in a position properly to assess whether the employee is impaired as a result of cannabis use and therefore represents a threat to safety (10).

Recent decisions of the Fair Work Commission have, therefore, highlighted the difficulty of measuring impairment directly and the fact that impairment associated with drug use can be caused by factors other than acute intoxication, thus justifying a wider window of detection.

Only limited studies have compared paired specimen collections of urine and oral fluid (11), but these studies have not involved random workplace testing. Vindenes *et al.* (12) found oral fluid and urine results to be correlated in 68–99% of cases in a sample of patients receiving treatment for opioid dependence. Urine was more sensitive in detecting benzodiazepine and cannabis use. Another study conducted in chronic pain patients found an overall agreement of 85% between paired urine and oral fluid tests. Of note, 5.4% of results were positive in oral fluid but negative in urine and 9.6% were negative in oral fluid but positive in urine (13). Studies have also compared urine to oral fluid testing in individuals under criminal justice supervision (11) and these studies reported a concordance of 90–99% (14–16).

In terms of workplace testing, 1.5% of random urine drug tests in the USA federally mandated safety sensitive workforce, and 5.7% in the general US workforce were reported to be positive in 2014

compared to 9.5% of random oral fluid tests in the general US workforce (17). These samples were unpaired.

The primary aims of this study were to determine the relative detection rates of urine versus oral fluid testing in a safety sensitive industry and the number of workers who tested positive and were found to have a diagnosed substance use disorder or possible impairment at work.

Methods

As indicated above, the Sydney Trains Enterprise Agreement 2014 and the NSW Trains Enterprise Agreement 2014 required both parties to establish and monitor a trial of oral fluid testing as part of the employer's testing regime. A working party comprising employer, union and employee representation was established to design and oversee the trial.

The working party agreed that the trial would involve 1,500 paired drug tests. Participants in the trial were consecutive workers who were selected to undertake a compulsory random urine drug test in accordance with the Rail Safety National Law National Regulations 2012 and Sydney Trains and NSW Trains drug and alcohol policies. These workers were required to also undertake an oral fluid test immediately after their urine drug test, thereby creating contemporaneous paired samples for analysis. The trial ceased once 1,500 paired samples had been collected.

The urine drug tests were performed in accordance with AS/New Zealand Standard (NZS) 4308:2008 (18). The oral fluid tests were conducted in accordance with AS 4760:2006 (2). All samples were transported to an accredited laboratory where the urine specimens underwent initial screening by immunoassay and confirmatory testing of all presumptive positives by liquid chromatography mass spectrometry (LC–MS). Oral fluid specimens were screened by LC–MS using the non-immunoassay initial test and confirmatory target concentrations listed in table 5.1 of AS 4760:2006 (2). Any specimen that had a result above the target concentrations had a second aliquot taken and confirmed by a second LC–MS analysis using the same target concentration. See Table 1 for selected screening and confirmatory cut-off concentrations from these two standards. Benzodiazepines and phentermine were routinely tested in urine but not in oral fluid samples initially due to the absence of target concentrations for benzodiazepines and phentermine in AS 4760:2006 (2). Samples where benzodiazepines or phentermine were detected in urine subsequently underwent testing of the oral fluid paired sample

for benzodiazepines and phentermine at target values of 10 and 25 ng/mL, respectively.

All results where a substance was detected were referred to a medical review officer (MRO) to determine if the result was consistent with declared medications, in which case it was reported as negative, and also to clarify the time of medication or drug use. A result was declared positive if it was consistent with the use of an illicit drug or if further history revealed the use of a controlled substance without a clinical indication and an appropriate prescription.

In accordance with existing procedures, any person who returned a positive test, as defined above, was removed from rail safety work until such time as they successfully completed a drug and alcohol rehabilitation program. Participation in the program was voluntary and began with a comprehensive drug and alcohol medical assessment that was provided at no cost to the workers.

Workers were asked for their consent for de-identified data from their medical assessment to be used for the purposes of this study. In addition to confirmation of the substance(s) used and the timing of such use, the data obtained from the medical assessment related to the presence or absence of a substance use disorder as defined by DSM-5 (19), and the presence or absence of possible impairment at work following that particular episode of substance use. Possible impairment at work was defined in two ways:

- (i) on the basis of a history of impairing symptoms at work between that instance of drug use and the time of the drug tests, as reported by the worker to the assessing doctor;
- (ii) where the history provided by the worker was inconsistent with the positive result obtained and with subsequent drug test results.

Following their testing, all workers were asked to complete an optional anonymous questionnaire to gauge subjective preferences in relation to the testing matrix. Workers completing the questionnaire responded on a scale of 1–5. The questions asked in the survey were as follows:

- (i) The instructions provided by the authorized person were simple to understand;
- (ii) I found the oral fluid swab test procedure more or less uncomfortable than the urine test;
- (iii) I found the process of providing a swab sample to be quicker and easier than the urine test;
- (iv) I would be more comfortable providing oral fluid swab sample during routine drug and alcohol testing than providing a urine sample.

Table 1. Selected cut-off concentrations

AS/NZS 4308:2008 screening cut-off levels for urine (ng/mL)	AS/NZS 4308:2008 confirmation cut-off levels for urine (ng/mL)	AS 4760:2006 non-immunoassay initial test and confirmatory target concentrations for oral fluid (ng/mL)
Opiates 300	Morphine 300 Codeine 300	Morphine 25 Codeine 25
Amphetamine type substances 300	Amphetamine 150 Methylamphetamine 150 MDMA 150	Amphetamine 25 Methylamphetamine 25 MDMA 25
Benzodiazepines 200	Phentermine 500 Temazepam 200 Oxazepam 200	Phentermine 25 ^a Temazepam 10 ^a Oxazepam 10 ^a
Cannabis metabolites 50	THCCOOH 15	THC 10
Cocaine metabolites 300	Benzoyllecgonine 150 Ecgonine methyl ester 150	Benzoyllecgonine 25 Ecgonine methyl ester 25 Cocaine 25

^aTarget value set by testing laboratory.

Table II. Summary of all results

	Urine			Oral fluid		
	<i>n</i>	%	95% CI	<i>n</i>	%	95% CI
Individuals with detections	56	3.7	2.77–4.69	8	0.5	0.16–0.90
Individuals with positive results	11	0.7	0.27–1.12	3	0.2	0–0.43
Adulterations	1	0.1	0–0.26	1	0.1	0–0.26
Mean collection time	6.2 ^a min	NA	6.1–6.3 min	5.1	NA	5.0–5.2 min

^aIncludes average 1.5 min form completion time.

Table III. All substances detected

Substance	Urine, <i>n</i> [mean time from dose]	Oral fluid, <i>n</i> [mean time from dose]	<i>p</i>
Codeine	28 [10 h]	3 [3 h]	<0.0001
Morphine	18 [19 h]		^a
Pholcodeine	1 [24 h]		^a
Amphetamine	5 [37 h]	1 [5 h]	0.0455
Methylamphetamine	2 [77 h]	1 [82 h]	0.3173
Pseudoephedrine	1 [1 h]		^a
Phentermine	3 [4 h]	1 [2 h]	0.1573
MDMA	2 [65 h]		^a
Cocaine	3 [55 h]	1 [50 h]	0.1573
metabolites/ cocaine			
THCCOOH/THC	5 [86 h]	1 [1 h]	0.1025
Benzodiazepines ^a	8 [131 h]		^a
Total results	76	8	

^aMcNemar test could not be performed due to the lack of a detection in oral fluid.

All data were de-identified and entered into an Excel spreadsheet. 95% confidence intervals (CI) were calculated and data analysis performed using the McNemar test.

Overall approval for the trial and the trial methodology was provided by the working party comprising employer, union and employee representation. Ethical approval for the study was obtained from Bellberry Limited ethics committee.

Results

A total of 1,501 workers were tested, comprising 1,500 paired samples of urine and oral fluid and one additional case, excluded from the analysis, where the worker initially refused oral fluid testing but subsequently consented and the urine sample was re-collected concurrently with the oral fluid. Substances were detected in 3.7% ($n = 56$) of urine samples and 0.5% ($n = 8$) of oral fluid samples ($p < 0.0001$). Seventeen of the 56 urine samples contained more than one substance. Seven of the detections on oral fluid were also detected in urine. One worker (0.07%) had a substance detected on oral fluid alone versus 49 workers (3.3%) that had substances detected on urine alone. All detections are summarized in Tables II and III, with Table III also including the average self-reported time from taking a medication or substance to the test. The time of taking a medication or substance was unavailable for three workers with detections on urine alone.

Table IV. Results considered to be positive

Substance(s)	Urine, <i>n</i>	Oral fluid, <i>n</i>
Cocaine metabolites/cocaine	3	1 ^a
Amphetamine/methylamphetamine	2	1 ^a
MDMA	2	0
THCCOOH/THC	5	1
Phentermine	1	0
Total positive detections	13	3

^aSubstance detected in both urine and oral fluid.

Eight workers had benzodiazepines (oxazepam and/or temazepam) detected in their urine and three had phentermine detected. The oral fluid samples of these workers were subsequently tested for oxazepam and temazepam at a target value of 10 ng/mL, or phentermine at a target value of 25 ng/mL. Phentermine was confirmed in one oral fluid sample but oxazepam and temazepam were not detected.

Twelve workers were deemed to have returned a positive result due to the detection of an illicit substance or substances, or because further history revealed the use of a controlled substance without a clinical indication and an appropriate prescription. Nine workers were positive on urine alone, one on oral fluid alone and two on both ($p = 0.0114$). The results deemed to be positive, as defined above, are summarized in Table IV. Note that two of these workers tested positive to more than one substance.

Of the 12 workers who tested positive, 11 attended a medical assessment and consented to de-identified data being used for the study. Four admitted to attending work after the episode of drug use whilst still impaired. In a further three cases, on the basis of their overall substance use history and medical assessment findings, the assessing doctor felt that impairment at work was possible after the current episode of drug use, and two of these workers were also diagnosed with a substance use disorder. The results from the 11 medical assessments are summarized in Table V.

A voluntary anonymous questionnaire was also provided to all workers who participated in the trial and the response rate to the survey was 85%. The results of the questionnaire are provided in Figure 1. The mean time to undertake the test components was 1.5 min for form completion, 4.7 min for the urine collection and 5.1 min for the oral fluid collection. The form completion immediately preceded the urine collection, thus making these components of the testing process 6.2 min in total and likely contributing to the perception that the oral fluid collection was quicker and easier than the urine collection.

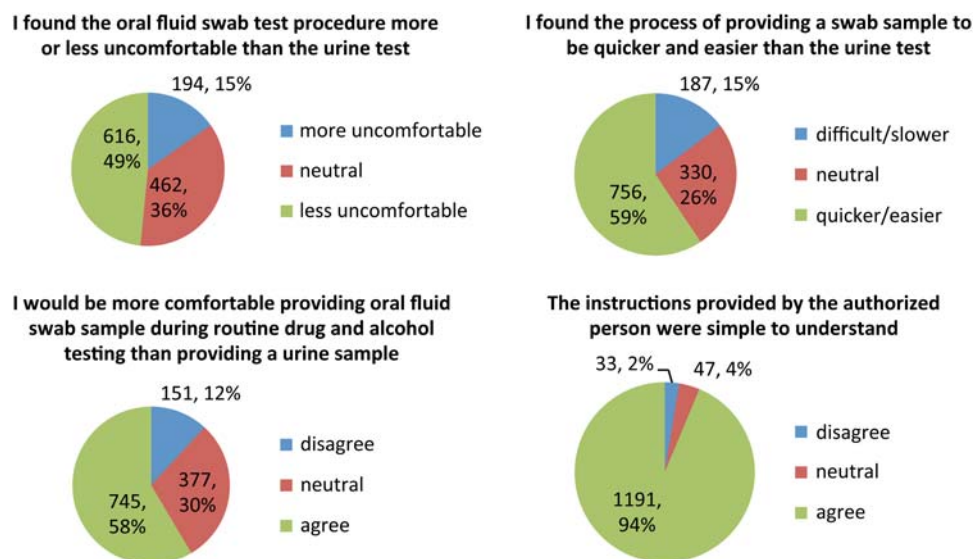
Discussion

This study supports the hypothesis that urine drug testing performed in accordance with AS/NZS 4308:2008 is more likely to detect overall use of substances compared to oral fluid testing that is conducted in accordance with AS 4760:2006, with an overall detection rate of 3.7% versus 0.5% ($p < 0.0001$). Urine was also significantly more likely to detect workers using illicit substances, or controlled substances without a clinical indication and valid prescription, than oral fluid, with an overall positive rate of 0.7% for urine versus 0.2% for oral fluid ($p = 0.0114$). Finally, more workers with possible impairment at work and a substance use disorder were detected on urine testing than on oral fluid testing.

The strengths of the study are as follows: the use of paired contemporaneous samples to enable urine and oral fluid results for each

Table V. Workers with positive results and a concurrent substance use disorder or possible impairment

Matrix	Possible impairment				Substance use disorder	
	Self-admitted, <i>n</i>	Clinically assessed, <i>n</i>	Total yes, <i>n</i> (%)	No, <i>n</i> (%)	Yes, <i>n</i> (%)	No, <i>n</i> (%)
Urine	4	2	6 (55)	5 (45)	2 (18)	9 (82)
Oral fluid	1	1	2 (18)	9 (82)	0 (0)	11 (100)

**Figure 1.** Results of voluntary questionnaire.

individual to be directly compared; the complete set of drug test results due to the study design; and the high participation rate (92%) in the medical assessment component of the trial which yielded the data on the presence or absence of a substance use disorder and possible impairment at work.

Limitations of the study are as follows: the small number of individuals with positive results (12) and with possible impairment (7) and substance use disorders (2); the absence of target concentrations for benzodiazepines and phentermine in AS 4760:2006 (2) and the need for the laboratory to set these target values; the testing for benzodiazepines and phentermine in oral fluid only in those samples where benzodiazepines or phentermine were first detected in the paired urine sample; and one worker with a positive test not attending the medical assessment. The findings in relation to possible impairment at work and substance use disorders did not reach statistical significance and require further study.

The significant difference in urine and oral fluid results reflects the longer window of detection for substances in urine, but is at odds with previous studies (12–16). Those studies, however, were in patients treated for opioid use disorder and chronic pain and individuals subject to criminal justice supervision, where the high reported concordance could be explained by frequent drug testing and the daily administration of medications. US urine and oral fluid results are also not directly comparable to urine and oral fluid tests conducted in accordance with AS/NZS 4308:2008 and AS 4760:2006. The US Federal urine drug testing cut-off values are higher for amphetamine/methamphetamine and codeine/morphine, with values of 500 and 2,000 ng/mL in the US (20) versus 150 and 300 ng/mL, respectively, in Australia (18). The Substance Abuse and Mental Health Services Administration (SAMSHA) cut-off concentrations

for oral fluid (21), on the other hand, are lower than the target concentrations in AS 4760:2006 (2). The large difference in the positive oral fluid random testing rate reported in the USA (17), compared to this study (9.5% versus 0.2%), can be explained by the lower target concentrations in the USA and the fact that the 9.5% figure relates to the general US workforce, whereas this study was in a safety critical workforce with a long-standing drug testing program. The difference in random urine positive results is less easily explained, with 1.5% of the US federally mandated safety sensitive workforce testing positive compared to 0.8% in this study, despite the US Federal drug testing cut-off concentrations being higher than their respective cut-off values in AS/NZS 4308:2008 for codeine, morphine, amphetamine and methamphetamine. The difference may reflect the organizational culture of the study population, the MRO guidelines and training provided in the USA, and the fact that codeine is available over-the-counter in Australia. The detection of codeine or morphine in an Australian urine drug test with declared over-the-counter codeine use invariably results in the test being recorded as negative. No cases of codeine or morphine detection in this study led to a result being deemed positive. This is in contrast to positivity rates for the Federally mandated safety sensitive workforce in the USA where 0.15% of tests are positive to opiates other than 6-acetyl morphine (17) and 0.03% are positive to phencyclidine (17) which does not form part of testing under AS/NZS 4308:2008.

Comparison of individual drugs showed that urine was significantly more likely to detect codeine and amphetamine and that morphine, pseudoephedrine, 3,4-methylenedioxymethylamphetamine (MDMA) and benzodiazepines were only detected in urine. 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (THCCOOH) was detected in five urine specimens, with one person also testing

positive to amphetamine and methylamphetamine, and tetrahydrocannabinol (THC) was detected in one oral fluid sample. Whilst not reaching statistical significance, the lower probability of detecting cannabis use with oral fluid testing raises safety concerns as all five of the workers returning positive urine tests for THCCOOH were found to have self-declared or possible impairment at work following that episode of drug use.

In the case of cannabis use by a previously abstinent individual, there is a narrow window immediately after use when an oral fluid test will detect THC but a urine test will not yet return a positive result. This possibility was highlighted by Deputy Senior President Hamberger in the Endeavour Energy decision (5). Clinically, the most likely individual to use cannabis at work, or immediately before commencing work, is a person who uses cannabis daily in a dependent fashion and such an individual will return a positive urine drug test due to their body stores of THC. This study, however, identified one person with a positive oral fluid test to THC but a negative urine test, indicating either drug test subversion or very recent use of cannabis in relation to work in a person who is not a regular user. The possibility of drug test subversion, particularly by substitution with a clean urine sample, cannot be completely excluded, but the sample temperature, creatinine, specific gravity and pH were within range, the adulterant check was negative, and additional urine biochemistry was performed which excluded a synthetic sample. These risks should, however, be viewed in context. For the one case of recent drug use and possible impairment at work detected only by oral fluid testing in this trial, five cases of possible impairment at work were detected only by urine testing and one case was detected by both methods. Overall, cases of self-declared workplace impairment favored urine over oral fluid by 4:1, including the one case that was detected by both methods.

More cases of drug use were detected in urine because of the longer window of detection and the self-admitted impairment and medically assessed impairment that was found to be present provides a challenge to the nation that oral fluid tests are better measures of impairment because they are correlated with more recent use. This study provides some preliminary evidence to suggest that a positive result from urine testing performed in accordance with AS/NZS 4308:2008 may be better correlated with impairment and substance use disorders than oral fluid testing performed in accordance with AS 4760:2006. If this relationship is confirmed by further study, then the rationale is likely to be because of the urine test's wider window of detection and, therefore, greater propensity to detect drug use and its associated complications.

Drummer (22) has reported that oral fluid should not be seen as a specimen that replaces the use of other specimens and that urine should still be seen as the specimen of choice if evidence of prior exposure to drugs is sought, e.g. routine workplace screening without cause. Commissioner Cambridge of the Fair Work Commission in *CFMEU v Port Kembla Coal Terminal Limited* (8) found that "there are a range of important benefits that can be derived from the random operation of both oral fluid and urine testing that each method cannot avoid if one method is used in isolation."

Subjective data from the participant survey relating to comfort and quickness/ease of the testing procedure revealed that participants were not polarized to one matrix over the other. Of note, 49% of respondents found the oral fluid test to be less uncomfortable than the urine test, 58% expressed a preference to provide oral fluid samples over urine during routine drug testing and 59% found the process of providing an oral fluid sample to be quicker and easier than providing the urine sample. The actual time taken for

specimen collection was, however, slightly quicker for urine (4.7 min) than oral fluid (5.1 min) once the time taken to complete paperwork was excluded. The participant responses do not, therefore, provide overwhelming support for one matrix over the other.

Conclusion

This study has shown that urine drug testing performed in accordance with AS/NZS 4308:2008 is more likely to detect overall substance use and illicit drug use than oral fluid testing conducted in accordance with AS 4760:2006. The results of this study also suggest that urine testing performed in accordance with AS/NZS 4308:2008 may be more likely to detect workers with possible impairment at work and substance use disorders than oral fluid testing performed in accordance with AS 4760:2006. Urine, therefore, is recommended as being the testing matrix of choice for routine random drug testing in safety sensitive industries in Australia. This study has also confirmed that urine drug testing may miss very recent use of cannabis by a previously abstinent person and thus the use of both urine and oral fluid would provide a greater level of assurance and could be indicated in selected circumstances, such as for targeted or post-incident testing, in a similar way to that considered and endorsed by Commissioner Cambridge (8). Further study of the paired results of such a program would provide greater evidence concerning the risks described in this study and further study is also required to determine whether the findings in relation to possible impairment and substance use disorders are replicated and reach significance in a larger cohort.

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